IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Number: 10/065,865
Confirmation Number: 3389
Applicant: John Yupeng Gui et al.
Filed: 11/26/2002
Group Art Unit: 3687
Examiner: Shin, John Y
Docket Number: 121985-1

For: SYSTEM AND METHOD FOR PROVIDING INTELLIGENT ASSET MANAGEMENT AND TRACKING CAPABILITIES

DECLARATION OF JOSEPH SALVO UNDER 37 C.F.R. § 1.131

I, Joseph Salvo, hereby declare as follows:

1. My name is Joseph Salvo and I currently reside in New York; my current address is 1155 Avon Road Schenectady, New York 12308.

2. I am a named co-inventor of the invention disclosed and claimed in the above-identified patent application, serial number 10/065,865, filed with the United States Patent and Trademark Office on November 26, 2002 and assigned Attorney Docket Number (121985-1, and alternatively 30011).

3. At the time the invention claimed in the referenced application was made, I was employed by General Electric Company at its Corporate Research and Development facility in Niskayuna, New York as the Manager of the Pervasive Decisioning Systems Laboratory.

4. My co-inventors and I conceived and reduced to practice the subject matter disclosed and claimed in the above-referenced patent application prior to June 11, 2002. Such conception and reduction to practice is evidenced by the General Electric Patent Disclosure Letter, dated December 10, 2001, a true and

accurate redacted copy of which is attached hereto as Exhibit A. Such conception and reduction to practice is also evidenced by GE presentation titled, "Materials Management Digitization Program," a true and accurate redacted copy of which is attached hereto as Exhibit B. The disclosure given in Exhibit A and Exhibit B illustrate a system and method for enabling enhanced asset management and tracking capabilities as disclosed in the present application.

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true. Furthermore, these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Title 18, United States Code §1001 and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Inventor _____
(Joseph Salvo)

Date: 4/13/2009

[redacted]

GE Patent Disclosure Letter System

DOCKET NUMBER

30011

DOCKET DATE

Monday, December 10, 2001

TITLE OF INVENTION

Intelligent e-tags and their applications

GE TECHNOLOGY AREA(S)

[redacted]

Keywords:

[redacted]

Keywords:

[redacted]

EXHIBIT A
IN SUPPORT OF DECLARATION
OF JOSEPH SALVO
UNDER R. 37 C.F.R §1.131
(REDACTED)

Keywords:

Keywords:

Keywords:

PROJECT NAME

PROJECT NUMBER

PROJECT LEADER

BUSINESS OR ORG. CONTACT INFORMATION

NAME

PHONE NUMBER

Circumstances Invention Conceived i.e., described in patent notebook (include page #), technical report, letter, discussed in meeting minutes, etc.

Some ideas came up at intelligent sensors brainstorming session. Some ideas were generated through experimentation with RFID tags and through implementation of an RFID proof-of-concept project.

ABSTRACT OF THE INVENTION

Please write a brief explanation of the invention (Limit to 350 words)

We propose to develop intelligent e-tags (or called functional e-tags) that have at least one of following functions: 1) RFID (radio frequency identification) with sensor capability (sensor tags); 2) RFID with signal processing and/or decision making capability; 3) RFID with tag-to-tag communication capability; and 4) RFID with ultra-low or self-power capability. In general a RFID tag means an electronic device that can communicate specific identification information through radio frequency communications techniques. Incorporating/integrating sensor capability greatly expands RFID tag's capability in the following ways: 1) It not only stores and communicates its ID information, but also its environment conditions. There are a variety of chemical, physical and biological sensors that can be integrated with RFID tags. These sensor tags can be used for monitoring the location, activity or/and conditions of the tracked assets, machines or processes. For example, a vibration e-tag by combining a vibration sensor and RFID tag can be used to report the vibration level of a heavy machine. 2) Its RFID communication can be controlled by its sensor signals. For example, a speed tag can activate the tag power and record/broadcast its speed once the tag reaches a pre-set speed. The signal processing and decision making (SPDM) capability is very important for distributed signal

processing and pervasive informatics. SPDM system can either be a modular unit or an integrated board on the tag. With SPDM, processed data, rather than raw data, are stored or sent out. Better yet, a decision is sent out to a control unit for automated operation. Tag-to-tag communication enables two-way data sharing, thus localized diagnostic and control. Different tags with different sensing capabilities and decision logic will enable cross-analysis of a matrix of information in a collaborative fashion, rather than singular sensor data analysis. Self-powered or micro-/nano-powered tags are critical for tag life. By self-powered, we mean the power source being acquired from the environment, rather than battery. Examples of self power are power generated from temperature gradient, pressure difference, vibration, movement, radio wave background, light, and wind. It can also be considered to use trace level radioactive material without any harm to people to power the tags.

BACKGROUND OF THE INVENTION

Please describe the problem or requirement addressed by your invention.

Current RFID devices are mainly a 'license plate' or self identification devices with limited wireless communication capability. There are many applications where this identification information is inadequate. Some advanced RFID tags may possess memory and/or writable functions. The most advanced RFID tags may even have temperature or power sensing capability. However, there are needs where users may want to know the environmental conditions of the tags or to regulate tag's operation based on specific parameters being monitored. For example, users may want to know whether his delicate shipment has been tilted outside specifications or whether his precision instrument has experienced any impact. Another example would be that a tag may signal if its pressure reading exceeds a pre-determined value - such signal may be either visible, audible, or a combination. Currently, sensors are usually hard wired (point-to-point) and do not indicate identification information. Wiring sensors for power and/or communication is not only expensive, but may also be impossible in many cases. Two-way communication between sensors is critical for localized diagnostics and control. Two way communication is also important to achieve data reliability with minimum sensors. In the remote service industry where machine health condition is assessed through the sensor data. It is common practice to increase data reliability through the use of multiple sensors for one target variable. This sensor redundancy results in high installation costs and sometimes forces product design change. There are two types of data that are generic to all product and important for most of service industry- one is

static data such as product material, manufacturing date, and product specifications, another one is dynamic data such as operation conditions, and performance parameters. The first type of data can be addressed by an identification code(such as serial number) that may be conveyed through a barcode or a RFID. The second type of data can be obtained by combining local sensor readings and RFID identification codes.

How has this problem or requirement been addressed before?

Product or material identification has been done by physical marking, paper labeling, barcoding or RFID devices. Marking and labeling require extensive manual operation with great potential for error. Barcoding greatly reduces entry errors and speeds up data flow, but still requires manual operation. RFID automates the identification process and can record both static and dynamic information. Operation conditions and environmental parameters can be monitored by many types of sensors. Those sensors can be either integrated into an existing product or produced as add-on devices. Those sensors are usually wired for external power and communication to a collection box such as a computer.

[redacted]

Please list any relevant literature or patents of which you are aware.

DETAILED DESCRIPTION OF THE INVENTION

How does your invention work?

The proposed intelligent e-tags (or called functional e-tags) will have some or all of following features: 1) Wireless identification and sensor data transmission through radio frequency communication 2) signal processing and/or decision making capability; 3) tag-to-tag communication capability; and 4) ultra-low or self-power capability. An intelligent tag will be manufactured by either integrating sensors and RFID tag into one simple chip or by attaching miniature sensors to a special RFID tag that has A/D, processing or/and memory capabilities. Intelligent tags differ from current RFID tags in many aspects. First, they not only store and communicate their ID numbers, but also their environment conditions. Furthermore, the RF communication can be controlled by a designed sensor signal, or the sensor

[redacted]

operation can be controlled by the RF communication. Lastly, intelligent e-tags can conduct two-way communications. Please read appendix 1 for continuation.

Describe the important features of your invention and explain how to use the invention to solve the problems described above.

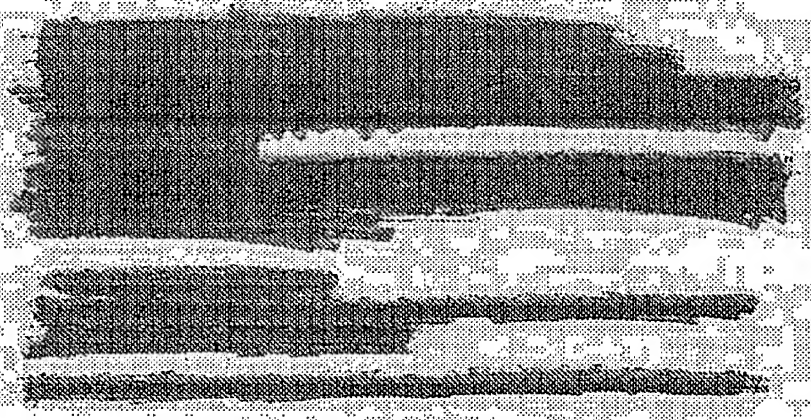
The most important feature is that intelligent e-tags combine identification, monitoring, processing and wireless communication together. Such an e-tag will enable pervasive informatic networks that will greatly enhance supply chain efficiency and revolutionize the product service industry.

What advantages are provided by your invention?

The advantages are: 1) Tags not only provide ID but also targeted sensor data; 2) Tags with data processing capability (or signal conditioning capability); 3) RFID and sensor can be inter-controllable; 4) tags with two-way communication; and 5) Tags with self-power capability.

Briefly describe any efforts to make a prototype of your invention or to test your invention. Additionally, summarize the results of any related experiments and testing and highlight any results of particular significance.

We have constructed two functional tags by combining a force sensor and a tilt sensor to an active RFID tag with memory. By applying forces to the force sensor, we can receive the force data wirelessly using a handheld device. The same is achieved for the tilt tag. We are in the process to design a collision tag by integrating an accelerometer with a RFID tag. The tag will be in an inactive mode, but will begin transmitting when there is a collision and the related data (date, time, collision level, collision direction, etc) will be recorded.

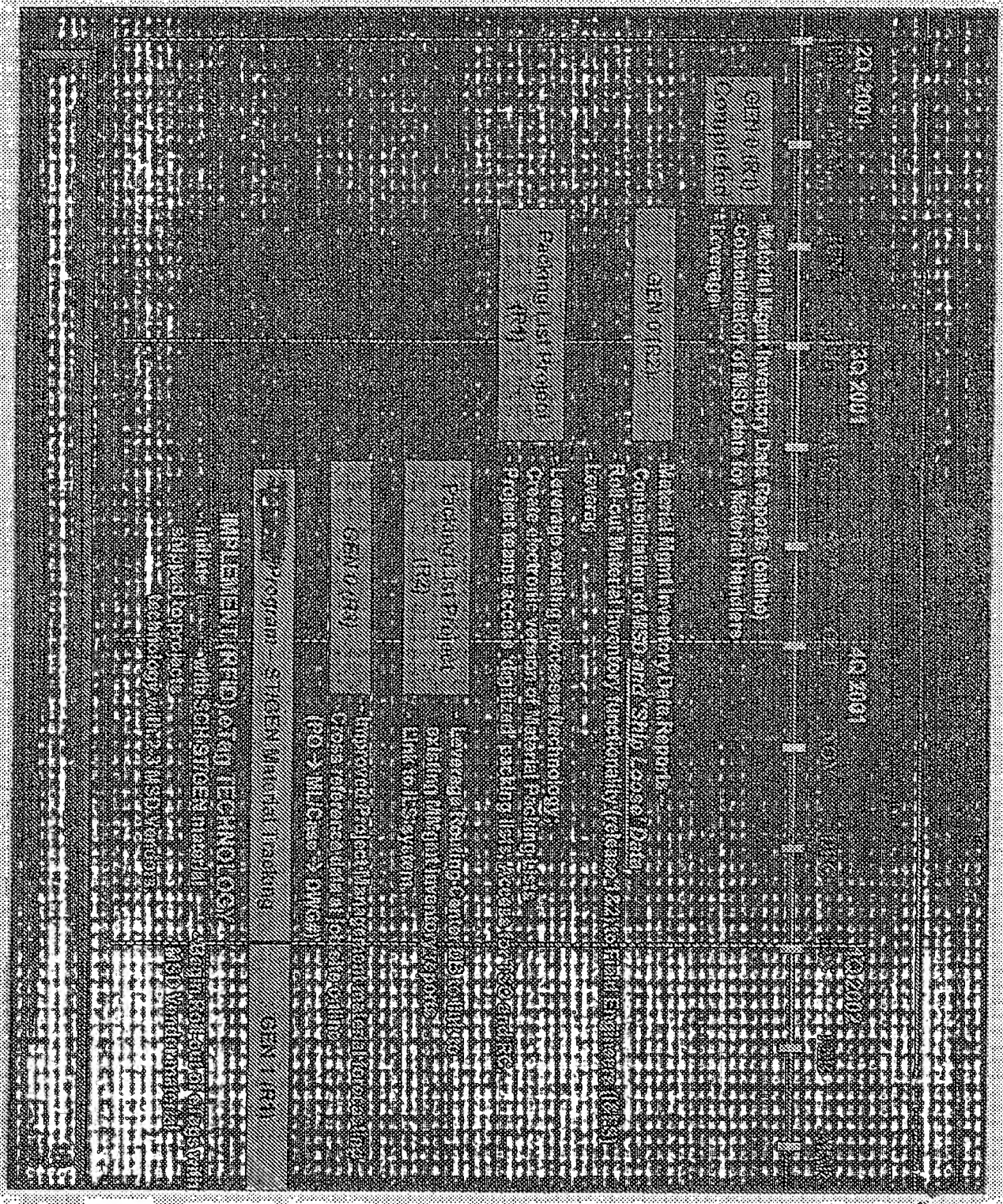


4/1/2009

unique identification, wireless (RF) communication, and/or mini-computing ability (processing, memory, read/write. 2)The device can be an integrated piece or an integration of several modular pieces. It may or may not have its own power source. 3)Multiple sensoring means the device can sense at least one of performance/environmental parameters such as moisture, speed, pressure, level, tilt, temperature, chemicals, and biological species. Sensors can be either integrated into the RFID board, or connected to the board, or both. 4)Sensors can be either powered by an external power source, an internal battery or self-powered (such as using RF radiation, or powered gathered from environment (e.g. photon energy, thermal energy and vibration energy) 5)Preferred sensors are those that can be miniaturized with extremely low power consumption. Examples of these sensors are micromachined sensors such as accelerometer, thermal, pressure, motion, etc. However, if the tag is powered by photovoltaic cell or wind or other environmental power sources, sensor power consumption is not a big issue. 6)Sensors can be either integrated part of RFID tag or an independent part that is connected to the tag. We have proposed to use MEMS technologies (but not exclusive to MEMS) to fabricate sensor and tag onto the same chip. 7)The tag unique identification can be permanently embedded into the tag memory or can be changed when needed. 8)The tag has data processing capability and can store and broadcast selective data 9) The tag possesses two-way communication capability and recognizes the communicating party.

EXHIBIT B

IN SUPPORT OF DECLARATION OF JOSEPH SALVO UNDER 37 C.F.R. 1.131



Wireless Devices

Proposed Devices to be used:

HANDHELD RFID READERS

Basic Functions:

- Graphical Device Interface
- Touch-screen Windows interface
- Windows CE

Current Functions:

- Bar Code Scanner—Reads standard bar code formats
- RFID—Reads and writes radio frequency ID data
- Wireless Communication—Connects to Wireless LAN
- Data Logging—Records scanned data

Symbol

Intermec 2400 Series

- Develop Platform Independent Application Using Standard Hardware